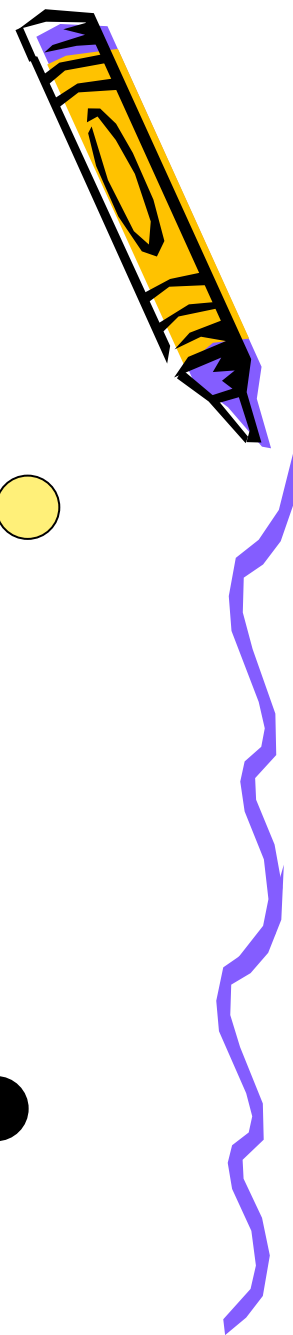


Lewis Dot Structures



Gilbert Newton Lewis



Lewis Dot Structures

For atoms---

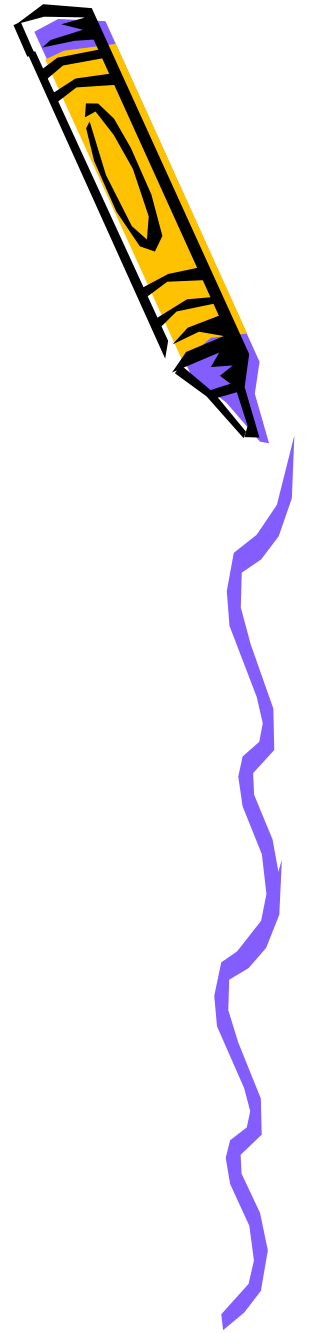
1. Figure out how many valence electrons an atom has.
2. Draw the electrons one at a time around the atoms symbol in a clockwise fashion starting on the top.
3. After one electron is on each side, double them up until you run out of electrons.



Lewis Dot Diagrams for Elements in Periods 2 and 3

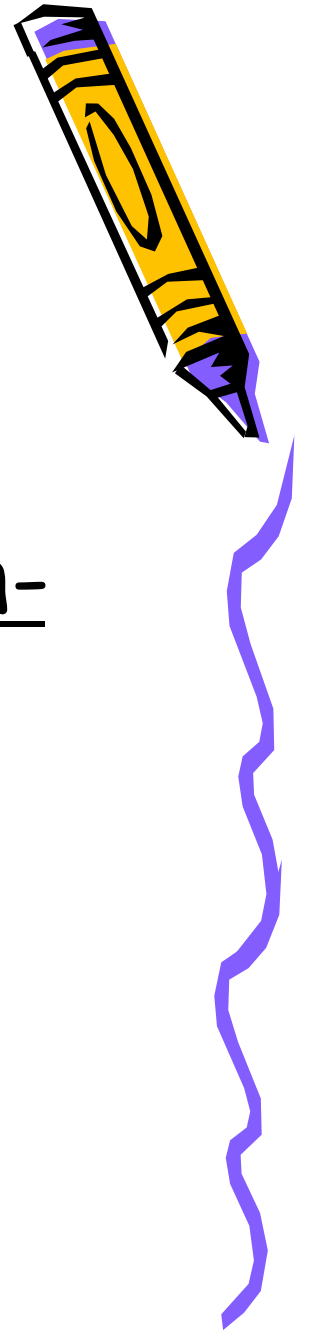
| Element | | | Element | | |
|---------|--|--|---------|--|--|
| Li | | | Na | | |
| Be | | | Mg | | |
| B | | | Al | | |
| C | | | Si | | |
| N | | | P | | |
| O | | | S | | |
| F | | | Cl | | |
| Ne | | | Ar | | |

Ionic Compounds Vs Covalent Molecules/ Compounds



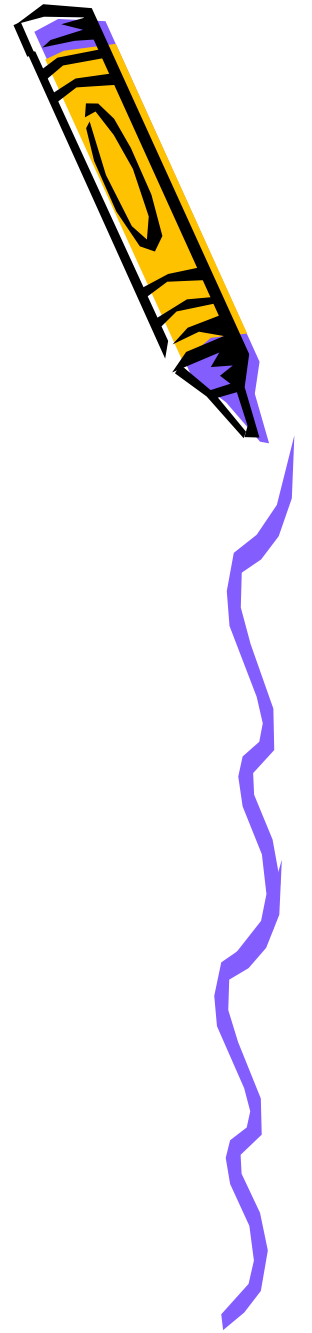
• Ionic Compounds

- Made up of a metal and a non-metal
- Formed from ions
- Electrons are transferred



• Covalent Molecules

- Made up of two non-metals
- Ions are not formed
- Electrons are shared



Rules for writing ionic compound Lewis structures



1. Determine that a metal is present / first element on left of periodic table (Not counting H).
2. Write the Lewis structures for the elements in the ionic compound.
3. Draw an arrow showing the transfer of the electrons from the metal (low electronegativity / one giving up an electron) to the non-metal (high electronegativity / one taking the electron)





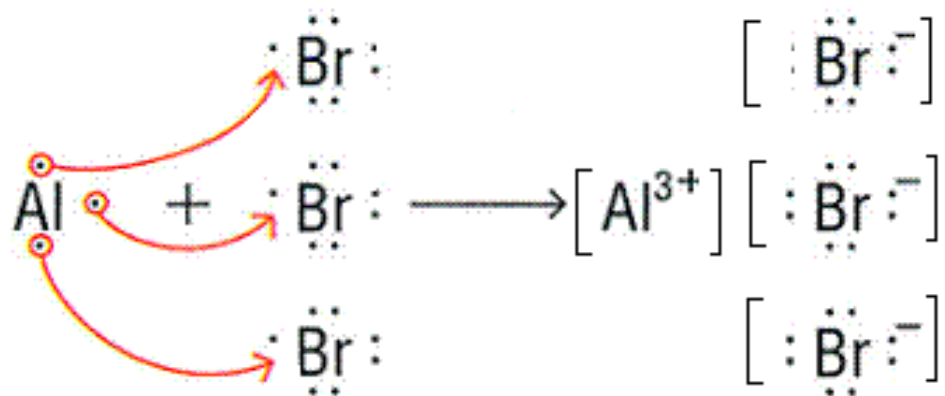
Bromine (Br_2)



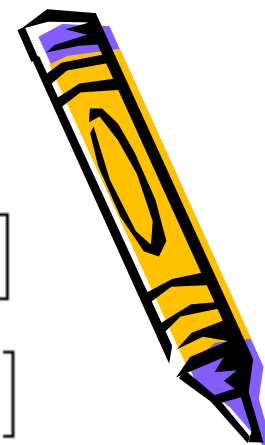
Aluminum (Al)



Aluminum bromide (AlBr_3)

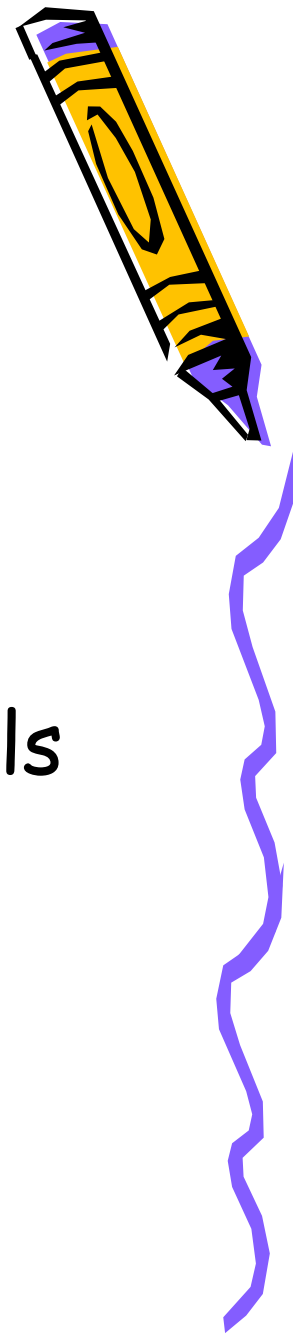


Ionic Compounds



Covalent Compounds

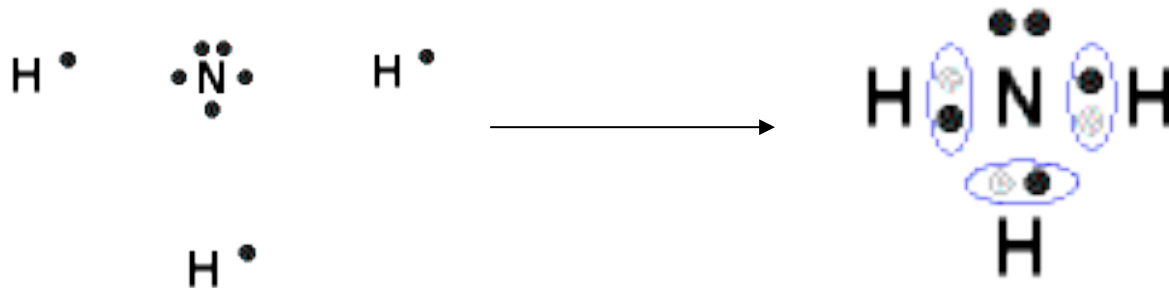
- Usually composed of two non-metals



Rules for writing Covalent compound Lewis structures (Molecules)

1. Draw the Lewis structure for each of the elements
2. See how many of the electrons are unpaired and could be shared so that the atoms will each get eight around them (or two for H)
3. Circle the shared pairs of electrons.

Example NH_3



1.

-Sum the valence electrons from all the atoms in the molecule.

-Do not worry about which electron comes from which atom.

-It is only the total number of electrons that is important.



2.

- Use a pair of electrons in the form of a line to show a bond between each pair of atoms.
- The central atom is usually by itself in the formula.

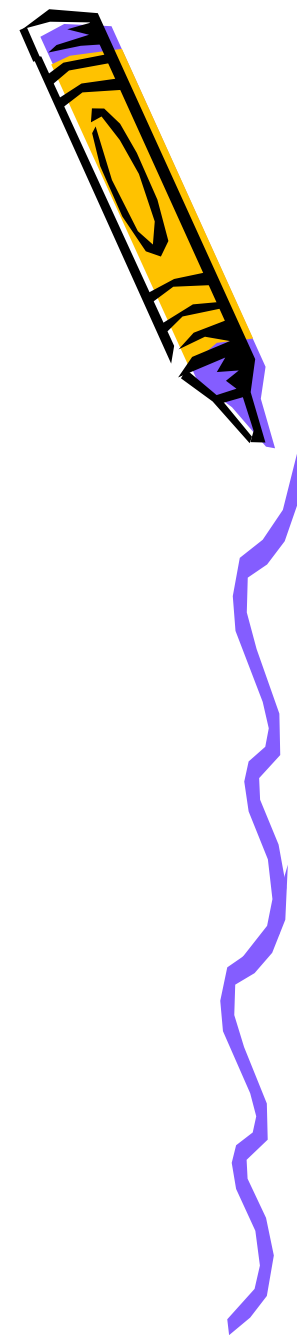


3.

-Arrange the remaining electrons to satisfy the duet rule for Hydrogen and the octet rule for other elements.

-Carbon, Nitrogen, Oxygen and Fluorine (CNOF) will never violate the octet rule, other elements can.

-If an atom violates the OCTET Rule, it usually is the central atom.





| Number of Valence Electrons | 1 | | 2 | | 3 |
|---|--------------------|----------------------------|--------------|-----------------------------------|-----------------------------|
| Example | Hydrogen | Group I (Alkali metals) | Helium | Group II (alkali earth metals) | Group III |
| Lewis Structure (electron dot diagram) | H^\bullet | Li^\bullet | He: | $\bullet\text{Be}\bullet$ | $\cdot\ddot{\text{B}}\cdot$ |

| 4 | 5 | 6 | 7 | 8 |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|--|
| Group IV | Group V | Group VI | Group VII (Halogens) | Group VIII except Helium (Noble Gases) |
| $\cdot\ddot{\text{C}}\cdot$ | $\cdot\ddot{\text{N}}\cdot$ | $\cdot\ddot{\text{O}}\cdot$ | $\cdot\ddot{\text{F}}\cdot$ | $\cdot\ddot{\text{Ne}}\cdot$ |

